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(54) Title: COMPOSITION AND METHOD FOR COATING FOODSTUFFS

(57) Abstract: A composition for coating foodstuffs is described, where the composition comprises a first polysaccharide that is negatively charged in the composition and gels under the influence of cations, and at least a second polysaccharide which is neutral in the composition. A method for producing an edible coating is also described, as well as a method for coating foodstuffs. A coating formed by the first-named method and a foodstuff which contains such a coating are furthermore disclosed.

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Composition and method for coating foodstuffs.

5 The invention relates to a composition for coating foodstuffs which comprises a first polysaccharide that is negatively charged in the composition and gels under the influence of cations, as well as a method for coating foodstuffs.

10 It is generally known in the food industry to coat foodstuffs such as sausage material, for example, with a coating (hereinafter also referred to as coating composition and also called "sausage casing"). For such coatings use is made of compositions which can be directly applied in liquid form onto
15 foodstuffs by, for example, co-extrusion or by immersing the foodstuff in the coating composition or spraying it therewith. Coatings can also be manufactured by extrusion, for example, and then be filled with a foodstuff.

 The coating is usually gelled, optionally after application
20 to the foodstuff, by bringing it into contact with a gelling agent, as a result of which the coating material gels, therewith obtaining the desired hardness. In the case of co-extrusion, for example, this gelling takes place after the co-extrusion. When the coating is formed after extrusion, for example, it is
25 then gelled before being filled with the foodstuff.

 In particular in the case of extrusion or co-extrusion, the rheological properties and especially the viscosity of the coating composition play a major role. If the viscosity is too low, the composition deliquesces before it can be gelled, so
30 that no cohesive coating can be formed. Too high a viscosity can lead to problems in extrusion and undesirable rippling of the coating. For this reason, apart from a gellable component, coating compositions generally contain a component to control viscosity.

35 From NL-C-102 930 a coating composition is known which mainly comprises water and the polysaccharide alginate, which composition would be suitable for co-extrusion around a foodstuff. Such alginate compositions, however, have been found to be unsatisfactory as coating compositions, because they do

not meet the rheological properties which are desired for co-extrusion, for example: because of e.g. the low alginate content (4 w/w%) the viscosity of the composition according to NL-C-102 930, is too low (± 30 Pa.s at 18°C) to be applied with a satisfactory result in co-extrusion.

In order to obtain an acceptable viscosity attempts were then made in the art to increase the alginate content, but it has been found that the desired viscosity can only be achieved with an alginate content of at least 8 w/w%. Such an alginate content, however, has the disadvantage that too strong gel formation occurs in gelling, leading to a foodstuff with a very unattractive appearance; the risk of rippling and cracking of the coating is thus very high. It has also been found that such an alginate coating from the technical point of view exhibits unsatisfactory adhesion to the food preparation, so that a food product is obtained around which there is a rather loose-fitting alginate coating.

Coatings based on collagen are also generally known in the art, and these have been used for a few decades, reference being made for example to NL-A-690339, EP-A-0 619 077 and WO-93/12660.

In the case of co-extrusion in particular, however, collagen has the disadvantage that after application of the coating to the foodstuff the collagen layer is highly vulnerable and should be hardened by removing water and by crosslinking the collagen. The removal of water generally takes place in a brine bath, while the crosslinking generally takes place in a chemical reaction by means of smoking or with the aid of liquid smoke, active crosslinking constituents thereof or smoke derivatives. In this connection reference is made to WO 93/12660. Other suitable crosslinking agents are generally known in the art, such as glutaraldehyde for example. The above-mentioned treatments, however, can have an unwanted effect on the taste of the coated product or product to be coated.

Another significant disadvantage of foodstuff coatings containing collagen is that the collagen is of animal origin and is therefore unsuitable for coating vegetarian and kosher food products for example.

An additional but significant disadvantage for application of protein of animal origin lies in the fact that animal products, and thus also animal protein, are usually barred when a disease such as e.g. BSE or swine fever is found in the animals in question, in order to avoid any risk to public health. In addition, bovine protein may be a carrier of diseases transmissible to man, such as Creutzfeldt-Jakob syndrome for example. In view of the above, the reliability of delivery of animal protein, and thus of coating material which contains it, may be adversely affected, among other things because under many national legislations the manufacturer must be able to prove that his products originate from healthy animals.

Because of the disadvantages of collagen, coating compositions have been produced which do not contain any collagen. Thus WO-99/55165 describes a collagen-free coating composition which comprises a combination of negatively charged gellable polysaccharides with a protein, where both the polysaccharides and the protein can work as gellable constituents, as well as for control of the viscosity. For this purpose such a composition contains 10 w/w% or more protein, which can also be of animal origin.

When protein in such quantities has been incorporated into a coating composition, this often leads to a coating with suboptimal properties. It is thus necessary to crosslink the coating composition after co-extrusion, which, as has already been described above, may affect the taste of the food product, and many proteins tend to colour the coating when the food product given a coating is boiled or fried for example.

It is therefore an object of the invention to provide a coating composition which has the desired rheological properties, which can be formulated independently of proteins, with which a sufficiently robust and stable coating can be formed using the extrusion or co-extrusion techniques that are commonly used in the food industry.

Surprisingly, this object is achieved through an improved coating composition for foodstuffs of the above-mentioned type,

in which the composition comprises at least a second polysaccharide which is neutral in the composition. The concept "neutral polysaccharide" is generally known in the art; this means a polysaccharide which essentially does not contain any charged groups and is preferably free of charged groups. The neutral polysaccharide is uncharged at pH values which are commonly used in the food industry when using polysaccharide-based coating compositions. Thus, the pH value will preferably lie between 4.0 and 9.5 when alginate for example is used in the composition; when pectin is used, the pH preferably lies between 2.0 and 9.5. When alginate in particular is used, these pH values lie more preferably between 4.5 and 7.5, even more preferably between 4.0 and 6.0, even more preferably between 4.5 and 5.5 and most preferably the pH is 5.0.

By incorporating a polysaccharide which is neutral at such a pH value it is possible to obtain a coating composition which possesses the rheological properties required for extrusion or co-extrusion. Neutral polysaccharides have been found to be eminently suitable for setting the right viscosity of the composition, essentially without adversely affecting the gelling of the gellable polysaccharide. The invention thus makes it possible to provide a polysaccharide-based coating composition with which coatings are produced which possess sufficient robustness and are essentially not vulnerable to damage in subsequent treatments. Examples of suitable neutral polysaccharides are cellulose, methylcellulose, hydroxypropylcellulose, methylethylcellulose and galactomannans (such as e.g. guar gum, tara gum and carob meal).

The expression "not adversely affect the gelling" means that by addition of the relevant neutral polysaccharides in a solution of gel-forming polysaccharides, such as alginate for example, gelling of the gel-forming polysaccharides is possible in a comparable way and to a comparable extent as in the absence of the neutral polysaccharides, when gelling is carried out in the way that is usual in the art.

The term "polysaccharide" also includes salts and acids of polysaccharides, as well as combinations thereof, and of

combinations of two or more polysaccharides. The polysaccharides of the coating composition according to the invention are preferably edible polysaccharides, in order to provide an edible coating.

5 Foodstuffs which can be coated with the composition according to the invention are generally known in the art, and include for example paste-like food preparations for the production of various types of sausage and other meat and fish products or products which contain vegetables and/or cheese, for
10 example.

Another advantage of the invention is that the coating does not need to contain any proteins, so that the above-mentioned disadvantages of coatings containing proteins are avoided, such as for example the colouring of the coated foodstuff when this
15 product is boiled and/or fried.

With the composition according to the invention it is thus possible to obtain a satisfactory coating for a foodstuff, in which the disadvantages of protein, especially collagen, such as those associated with water removal and crosslinking, can be
20 obviated - which can yield considerable savings in equipment and production time. Because the coating does not need to be crosslinked after gelling, it is also possible, with the composition according to the invention, to give fresh products a coating skin - something which has hitherto been found to be
25 scarcely possible with coating compositions based on collagen, because of the crosslinking reaction with liquid smoke which affects the taste.

Negatively charged polysaccharides which gel under the influence of cations (hereinafter referred to as gel-forming polysaccharide) are generally known in the art and have been
30 used for several decades in the food industry. Such a polysaccharide, or a salt or acid thereof, is usually dissolved in the coating composition and the polysaccharides are gelled by bringing them into contact with a solution which contains
35 cations. The cations undergo an electrostatic interaction with the gel-forming polysaccharides, as a result of which the latter form an undissolved complex with the cations and thus gelling

occurs. Depending on the polysaccharide used, monovalent or bivalent cations are applied for this purpose, as is known to the person skilled in the art. It is thus known, for example, that carrageenan gels in the presence of K^+ ions and that
5 alginate gels in the presence of bivalent ions, preferably Ca^{2+} ions.

In the coating composition according to the invention the first polysaccharide is preferably chosen from the group consisting of alginate, pectin, carrageenan or a combination of
10 two or more thereof. Said polysaccharides, especially alginate, have been found to be highly suitable for use as the gel-forming polysaccharide in the coating composition according to the invention.

When pectin is used as the gel-forming polysaccharide, the preferred form is low-esterified pectin, in which less than 50%
15 of the carboxylate groups of pectin is esterified with a methyl group (methyl alkylate). The low-esterified pectin has been found to be highly suitable for forming a good-quality coating skin.

In a preferred embodiment of the invention, the gel-forming first polysaccharide of the composition according to the invention comprises alginate. Alginate has for example the advantage that the coating can be exposed to high temperatures,
20 as is for example the case when the coated food product is boiled or fried, while the good properties of the coating, e.g. flexibility, strength and stretchability, are retained. In
25 addition, alginate has good gelling properties.

In order to obtain a good, robust and smooth coating, the coating composition according to the invention advantageously
30 comprises 1-7 w/w%, preferably 2-4 w/w% and most preferably 2.3-3.0 w/w% of the first polysaccharide, preferably alginate.

In a favourable embodiment of the coating composition the second polysaccharide comprises galactomannans. Galactomannans have been found to be highly suitable for controlling the
35 viscosity, which is of especial importance in extrusion or co-extrusion, and do substantially not affect the gelling of the gel-forming polysaccharides, because of the neutral character of

the galactomannans in the above-mentioned pH range. The lack of any charge on the galactomannans prevents them from taking part in the electrostatic interactions between the gelling agent and the gel-forming polysaccharides during the gelling. Examples of
5 galactomannans are carob gum, tara gum and guar gum, with guar gum, carob gum or a combination thereof being preferred.

Thus galactomannans, in particular guar gum, are highly suitable for bringing the viscosity to the proper value, it being possible to incorporate a suitable quantity of the
10 gellable polysaccharide into the composition in order to create a desired robustness and texture. While the viscosity can be controlled in a suitable way for co-extrusion in particular, the good gelling properties of the gel-forming polysaccharides, particularly alginate, are retained.

15 In a very advantageous embodiment the galactomannans in the coating composition comprise guar gum. Guar gum in fact has the advantage that unlike other galactomannans it is soluble when cold, i.e. at 4°C, as a result of which the processability of the coating composition is improved, since one can omit the
20 heating step necessary for dissolving many other polysaccharides and one can work at the desired process temperatures. This gives a saving in time and energy.

It has been found that when the composition comprises 2-10 w/w%, preferably 3-6 w/w% galactomannans, preferably guar
25 gum, an optimal coating can be obtained. It has in fact been found that when the galactomannans are used in these concentrations, the viscosity of the composition can be controlled in a way which is very suitable for extrusion or co-extrusion, it being possible to incorporate a suitable quantity
30 of the gelling polysaccharide into the composition in order to form an optimal coating.

The viscosity of the coating composition is preferably 80-110 Pa.s at a temperature of 20°C, so that the composition can be used very efficiently for extrusion and co-extrusion.

35 The person skilled in the art will realize that the viscosity also depends on the temperature of the composition. Thus, at low working temperatures (0-5°C) for example, less of

the neutral polysaccharide needs to be added in order to achieve the desired viscosity.

A coating or a food product co-extruded with a coating composition, the coating composition comprising guar gum and alginate, is/comprises an optimal coating skin which, regarding robustness and texture, is comparable with the current coatings based on protein, or even surpasses them. Thus a food product with a coating skin which contains alginate and guar gum can even be fried without the coating skin being damaged. This is scarcely possible with products with a protein coating, such as a co-extruded collagen coating.

As has already been explained above, the composition is eminently suitable for forming a protein-free coating composition. In a preferred embodiment the composition and also the coating are therefore protein-free. If desired, however, the composition can contain protein.

In a particular embodiment according to the invention the composition comprises 0-4 w/w% protein. Such a low quantity of protein can be incorporated into the coating composition for a number of advantageous reasons; it can for example promote binding between the coating and the foodstuff. Globular proteins in particular, such as collagen, have been found to be suitable for this purpose. By incorporating such a protein into the coating composition the bond between the coating skin and the coated food preparation can be improved, especially in the case of co-extrusion, so that a food product is obtained in which improved adhesion of the skin to the food contents is obtained. A composition with optimal adhesion properties is obtained when the coating composition comprises 0.5-2.5 w/w%, preferably 1-1.5 w/w% protein, e.g. collagen. In this composition the collagen acts mainly as a binding protein, and does not play a role in the robustness of the coating. The gelled alginate ensures the robustness of the coating skin. It should be pointed out in this connection that the coating after gelling, in order to obtain said adhesion properties, is preferably subjected to a crosslinking reaction of the protein, e.g. by bringing the coating after the co-extrusion and gelling

into contact with liquid smoke, an active crosslinking constituent thereof or a smoke derivative. It has also been found that in this connection the pH of the coating composition in the presence of protein preferably lies between 6.5 and 8.5, because outside this pH range the binding properties of the coating composition which are necessary in co-extrusion are obtained in lesser degree. To this end the composition is preferably buffered in view of the subsequent crosslinking reaction, which generally takes place under acid conditions. Preferred examples of suitable buffers are organic buffer systems, especially lactic acid/lactate, citric acid/NaOH and acetic acid/acetate buffers.

Protein can also be incorporated in order to give the food product a more attractive appearance, especially with regard to the colour. The protein content is then preferably 1 w/w% at most, at which concentration the protein generally does not make any essential contribution to the structure of the coating skin, and a crosslinking reaction is thus usually not necessary. At a content of 4 w/w% at most, the protein will essentially not make any contribution, i.e. will at most make a negligible contribution, to the viscosity and the gelling properties of the coating composition.

The coating composition can also contain a wetting agent, such as glycerol, propylene glycol, edible oil or ethanol. A wetting agent has a positive effect on the consistency, especially the plasticity of the coating. The wetting agent content is preferably 2-8 w/w%. The composition can also contain other additives, such as colorants and aromatic substances, preservatives and/or antimicrobial agents which are generally known in the art.

In particular, the invention relates to an edible coating for foodstuffs, in particular a sausage product, which comprises at least a first polysaccharide, which has been gelled under the influence of cations, and a second, neutral polysaccharide. Such a coating can be used and treated in any way which is customary in the art, with it being possible for the coating according to the invention to obtain any desired property,

insofar as elasticity, fragility, permeability to air and/or moisture and/or lipids and breaking strength are concerned, in a way which is known to the person skilled in the art.

The invention also relates to a method for producing an
5 edible coating, comprising the steps of:

- a) extruding a coating composition according to the invention to obtain an extruded coating composition, and
- b) bringing the extruded composition into contact with a gelling agent in order to form a gelled coating.

10 The method according to the invention makes it possible to obtain optimal coatings with the extrusion process under optimal process conditions by incorporating such a quantity of gelling polysaccharide into the composition by which a desired gelling
15 quality, and incorporating such a quantity of the neutral polysaccharide into the composition that the composition obtains the proper rheological properties, such as viscosity. After extrusion and gelling of the composition, the coating obtained can be subjected to one or more additional treatments, such as
20 drying, coating of the coating, in order to prevent it being influenced by the foodstuff for example, or cutting the coating into parts. Food preparations, preferably paste-like preparations, can then be incorporated into the coating.

An attractive embodiment of the invention provides, in a
25 method such as described above, for the production of a foodstuff by means of co-extrusion, where the coating composition in step a) is co-extruded around a foodstuff to be coated. Because of the extremely suitable rheological and gelling properties of the coating composition according to the
30 invention, the latter can be used very efficiently for co-extrusion. One of the advantages of co-extrusion is that complete foodstuffs, including the coating, can be manufactured very quickly in a continuous process.

Especially when a coating is formed which contains
35 alginate, which is preferable, the gelling agent preferably contains bivalent cations, more preferably alkaline-earth metal cations and even more preferably Ca^{2+} ions. In this connection a

water-soluble salt, preferably an alkaline-earth salt, such as a salt of magnesium, or more preferably a salt of calcium, is preferably used as the gelling agent.

The bringing of the co-extruded food product into contact
5 with a gelling agent usually takes place directly after the co-extrusion, by immersing the co-extruded food product in a bath which contains calcium chloride, calcium lactate or calcium acetate, with the concentration of Ca^{2+} ions usually being 0.5 M. Gelling can also take place by bringing the co-extruded food
10 product into contact with calcium ions in some other way, such as spraying or spreading with a calcium-containing solution for example.

The co-extruded food product is usually brought into contact with a bath containing calcium²⁺ for 5-10 seconds, with
15 the temperature of the bath being about 20°C and the calcium ion concentration being about 0.5 M.

In view of the teaching given herein, a person skilled in the art will be able, without any inventive skill, to choose the right amount of the neutral polysaccharide to obtain the desired
20 rheological properties, such as the viscosity of the coating composition according to the invention, in order to provide a coating composition which is optimally suited for co-extrusion.

It has been found that the quantity of available water in the coated foodstuff, also expressed in the art as the a_w value,
25 which can vary between 0 and 1, plays a significant role in the stability of the coating according to the invention. The a_w value is preferably as low as possible. If there is a large quantity of available water (high a_w value), there is unwanted water transport and thus ion transport between the foodstuff and
30 the coating. In such a situation the bivalent cations used for gelling can for example be replaced in the coating by monovalent cations from the foodstuff, as a result of which the insoluble complexes of the polysaccharide and the bivalent cation disintegrate and dissolve. This is, so to speak, a reversal of
35 the gelling process and can lead to the coating dissolving and being lost. Sodium phosphates in particular in the coating foodstuffs are a source of monovalent cations. The above-

mentioned disintegration process also occurs in the presence of Ca^{2+} -binding substances, such as di- and triphosphates, which are commonly used in the food industry.

The ion exchange and thus the decomposition of the coating
5 are also prevented by limiting the quantity of available water. This can be achieved by, for example, drying the foodstuff after coating, freezing the coated foodstuff or choosing a food preparation in which the quantity of available water is limited, such as a sausage paste for the English breakfast sausage known
10 in the art, or dry sausage types.

It is also possible to prevent the dissolution of the coating by adding to the foodstuff cations with which the gelling polysaccharide gels, such as calcium for example, so that the abovementioned disadvantageous exchanges are limited.
15 When the foodstuff is kept in an aqueous environment, such as in the case of canned or pickled sausage, the same effect can be obtained when such cations are incorporated in the aqueous environment. A gel-forming polysaccharide, such as alginate, can also be added to the foodstuff in order to sequester the
20 cations which are disadvantageous for the gelling. These additions, however, can have a disadvantageous effect on the taste and/or texture of the foodstuff.

Surprisingly it has also been found that the stability of the coating of a coated foodstuff manufactured by the method
25 according to the invention can be increased by bringing the coated foodstuff after gelling into an acid environment, the pH of which is 3 or less. To this end the coated foodstuff can for example be sprayed with or immersed in an acid solution. Such a solution preferably contains liquid smoke, a component or
30 derivative thereof, acetic acid or lactic acid, or a combination of two or more thereof. A person skilled in the art, however, can readily provide other suitable acid solutions to improve the stability of the coating skin.

The acid environment preferably contains acid smoke, a
35 component or derivative thereof. Without being considered to be tied to any explanation, it is thought that these components, unlike what happens in the presence of crosslinkable proteins in

the coating, such as collagen, do not play any role in a crosslinking reaction of the polysaccharides present in the coating, but undergo a crosslinking reaction with proteins which are present in the coated foodstuff.

5 In order to give the coating permanent robustness, irrespective of the free cation content of the coated foodstuff or foodstuff to be coated, in a preferred embodiment of the invention the formed coating is brought into contact with a solution, the solution comprising 0.1-0.5, preferably 0.25 w/w%
10 acetic acid, 0.1-0.5, preferably 0.25 w/w% lactic acid and 0.1-1.0, preferably 0.5 w/w% liquid smoke or smoke derivative.

It should be noted that the coating composition according to the invention can, if desired, be applied only partially to the foodstuff, so as to obtain an only partially coated
15 foodstuff.

The invention also relates to a coating obtainable by the method according to the invention, as well as to a foodstuff comprising such a coating. The coating has many applications and can for example be used for coating sausage products, cut
20 vegetable products, as well as for (partially) covering of foodstuffs such as leaf vegetables, in order to e.g. prevent brown discoloration of cut edges and to guarantee longer freshness.

The invention will be explained in greater detail below by
25 means of some examples. The stated percentages are percentages by weight, unless otherwise indicated.

Examples

30 Preparation of sausage dough

10.3 parts by weight of lean pork and 14.7 parts by weight of neck are minced through a 3 mm mincer. With this are mixed 2.7 parts by weight of ice, 0.018 parts by weight of nitrite curing salt, 0.002 parts by weight of phosphate, 0.001 parts by weight
35 of ascorbate, 0.001 parts by weight of flavour enhancer, 0.003 parts by weight of white pepper, 0.001 parts by weight of mace, 0.0005 parts by weight of coriander and 0.001 parts by weight of

ginger, after which blending to the desired degree of fineness is carried out.

Preparation of vegetarian sausage filling

- 5 For the preparation of vegetarian sausage filling, 3 dry mixtures are first made:

		% by wt.
Mixture 1	egg protein	18
	wheat protein	32
	milk protein	38
	common salt	12
Mixture 2	wheat fibre	25
	tapioca starch	75
Mixture 3	Textured wheat	50
	Vegetables and herbs	50

- 15 parts by weight of Mixture 1 are blended with 14 parts
10 by weight of oil until homogeneous, then 55 parts by weight of water are blended through Mixture 1, after which 7 parts by weight of Mixture 2 are added and blended until homogeneous. Finally, 9 parts by weight of Mixture 3 are added and mixed at low speed. The vegetarian sausage dough prepared in this way is
15 used as the filling for the casings.

Comparative example 1

- In a Hobart bakery mixer, fitted with a dough hook, 500 g of sodium alginate (Manugel DMB-Kelco) is mixed with 500 g of
20 propylene glycol. 9000 g of water is then gradually added. After addition of the water, mixing is carried out for a further 15 minutes in the highest position of the machine. Subsequently, the product is de-aerated under vacuum in a Stephan high-speed cutter. The product contains 5% alginate and
25 has an apparent viscosity of 15 Pa.s. Further processing of this product in a STORK-MPS co-extruder is not possible, because

the viscosity is too low. The product flows out of the machine and cannot be made into a homogeneous coating film.

Comparative example 2

5 The same as under comparative example 1, except that 800 g of alginate is mixed with 800 grams of propylene glycol, after which 8400 g of water is gradually added. The product contains 8% alginate and has an apparent viscosity of 85 Pa.s. The product is extruded together with the sausage dough described
10 above or the vegetarian sausage dough in a STORK-MPS co-extruder. The sausage formed with a diameter of 15 mm is passed for 5 seconds through a 5% CaCl_2 solution, after which it is portioned into units of 10 cm. The products are then pre-dried for 20 minutes at 75°C. Finally the products are pre-heated for
15 10 minutes in a steam cooker at 85°C. After cooling they are vacuum-packed. Result: the initial skin formation is satisfactory. The gel formed, however, is so strong and exhibits so much shrinkage during pre-drying that the products tear open, especially at the ends, and the filling comes out.

20

Example 1

The same as under comparative example 2, except that 250 g of alginate and 500 g of guar gum are mixed with 750 g of propylene glycol, after which 8500 g of water is gradually added. The
25 product contains 2.5% alginate and 5% guar gum and has an apparent viscosity of 100 Pa.s. The product is further processed as described under comparative example 2. Result: the product forms a good homogeneous coating skin which has a high mechanical resistance directly after gelling and which remains
30 intact after drying and pasteurization. The sausage formed exhibits well closed ends, with no escape of the filling. The final product retains its integrity during sterilization, baking, boiling and frying.

35 Example 2

The same as under example 1, except that the coating composition is manufactured in a dish cutter, without addition of propylene

glycol. The product thus contains 2.5% alginate and 5% guar and has an apparent viscosity of 105 Pa.s. After further processing the product gives comparable results to those described under example 1.

5

Example 3

The same as under example 2, except that 250 g of alginate and 350 g of guar in a dish cutter are dissolved in 7400 g of phosphate/lactate buffer with a pH of 7.5. Then 2000 g of collagen composition (430SCL-PV industries) with a protein content of 5% is thoroughly mixed with this. The product contains 2.5% alginate, 3.5% guar and 1% collagen protein. It has an apparent viscosity of 95 Pa.s and a pH of 6.7. The product is further processed as described under example 2.

15 Result: the product forms a good homogeneous coating skin which has a high mechanical resistance directly after gelling and remains intact after drying and pasteurization. The sausage formed exhibits well closed ends, with no escape of the filling. In addition, the adhesion of the casing to the contents is

20 greatly improved. The final product retains its integrity during sterilization, baking, boiling and frying.

Example 4

The same as under example 3, except that 200 g of alginate and 250 g of guar in a dish cutter are dissolved with 5550 g of phosphate/lactate buffer with a pH of 7.5. Then 4000 g of collagen composition with a protein content of 5% is thoroughly mixed with this. The product thus contains 2% alginate, 2.5% guar and 2% collagen protein. It has an apparent viscosity of

30 90 Pa.s and a pH of 6.5. The product is further processed as described under example 2, except that a small quantity of a liquid smoke derivative (2%) is added to the gelling bath, in order to promote the crosslinking of the collagen. Result: the product forms a good homogeneous coating skin which has adequate

35 mechanical resistance directly after the gelling bath, as a result of which no belt marks occur during transport in the system. The sausage exhibits well closed ends and the casing

gives good adhesion to the contents after drying and pasteurization.

Example 5

5 Preparation of sausage casing by extrusion

9250 g of water are put into a dish cutter. After the machine is started, 250 g of sodium alginate (manugel DMB-Kelco) is slowly added. After the addition the machine is run in the highest position for 5 minutes. 25 g of 50% lactic acid and
10 25 g of 50% acetic acid are then mixed in. Subsequently, 450 g of guar gum is blended in until a homogeneous paste is obtained. The product is de-aerated under vacuum in a Stephan high-speed cutter.

The paste has an apparent viscosity of 95 Pa.s and a pH of 4.9.

15 The paste is pressed with a sausage filling machine fitted with a concentric die, the central opening of which is closed off (the gap width is 0.35 mm in this system).

At a pressure of 10 bar a "paste cylinder" is thus formed with a diameter of 20 mm. Directly after leaving the die, the paste is
20 fixed by spraying with a 5% CaCl_2 solution. The cylinder shape is maintained by blowing air in. The sausage skin is finally dried for 1.5 hours at 50°C. The dried skin has a thickness of 55 microns.

The "coating" thus formed is filled with the earlier described
25 sausage dough and the vegetarian sausage dough. The sausages are then subjected to various processes, such as boiling, baking and frying. In all cases the skin retains its integrity and the sausages have an attractive appearance.

CLAIMS

1. Composition for coating foodstuffs which comprises a first polysaccharide that is negatively charged in the composition
5 and gels under the influence of cations, **characterized** in that the composition comprises at least a second polysaccharide which is neutral in the composition.
2. Composition according to claim 1, **characterized** in that the first polysaccharide is chosen from the group consisting of
10 alginate, pectin, carrageenan or a combination thereof.
3. Composition according to claim 1 or 2, **characterized** in that the first polysaccharide comprises alginate.
4. Composition according to claim 3, **characterized** in that the composition comprises 1-7 w/w%, preferably 2-4 w/w% and most
15 preferably 2.3-3.0 w/w% of the first polysaccharide, preferably alginate.
5. Composition according to any of the claims 1-4, **characterized** in that the second polysaccharide comprises galactomannans.
- 20 6. Composition according to claim 5, **characterized** in that the galactomannans are chosen from the group consisting of guar gum, carob gum or a combination thereof.
7. Composition according to claim 6, **characterized** in that the galactomannans comprise guar gum.
- 25 8. Composition according to any one of claims 5-7, **characterized** in that the composition comprises 2-10 w/w%, preferably 3-6 w/w% galactomannans, preferably guar gum.
9. Composition according to any one of claims 1-8, **characterized** in that at a temperature of 20°C the viscosity
30 of the composition is 80-100 Pa.s.
10. Composition according to any one of claims 1-9,

characterized in that the pH of the composition lies between 4.0 and 9.5, preferably between 4.0 and 7.5, more preferably between 4.0 and 6.0, even more preferably between 4.5 and 5.5, and is most preferably 5.

- 5 11. Composition according to any one of claims 1-10, **characterized** in that the composition comprises 0-4 w/w% protein.
12. Edible coating for foodstuffs, in particular a sausage product, which comprises at least a first polysaccharide
10 that has been gelled under the influence of cations, and a second, neutral polysaccharide.
13. Method for producing an edible coating, comprising the steps of:
- 15 a) extruding a coating composition according to any one of claims 1-11 to obtain an extruded coating composition, and
b) bringing the extruded composition into contact with a gelling agent to form a gelled coating.
14. Method according to claim 13, **characterized** in that the coating composition in step a) is co-extruded around a
20 foodstuff to be coated.
15. Method according to one of claims 13-14, **characterized** in that the composition after step b) is brought into an acid environment, the pH of which is 3 or less.
- 25 16. Method according to claim 15, **characterized** in that the acid environment comprises liquid smoke, a component or derivative thereof, lactic acid, acetic acid or a combination of two or more thereof.
- 30 17. Method according to any one of claims 13-16, **characterized** in that the coating formed is brought into contact with a solution, the solution comprising 0.1-0.5 w/w%, preferably 0.25 w/w% acetic acid, 0.1-0.5 w/w%, preferably 0.25 w/w%

lactic acid and 0.1-1.0 w/w%, preferably 0.5 w/w% liquid smoke or a derivative thereof.

18. Coating obtainable by the method according to any one of claims 13-17.
- 5 19. Foodstuff which contains a coating according to claim 12 or 18.

INTERNATIONAL SEARCH REPORT

Interr I Application No

PCT / NL 01/00628

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 A23L1/0532 A23L1/0526 A23P1/12 A22C13/00 A23P1/08
 A23L1/317

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A23L A23P A22C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 55165 A (DEN BURG ANTHONIUS CORNELIS VA ;GIST BROCADES BV (NL); HAAN BEN RU) 4 November 1999 (1999-11-04) cited in the application page 2, paragraph 3 page 3 page 7, line 11 -page 8, line 27 examples 1,7,8,10 ----	1-4,9-19
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
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- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
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Date of the actual completion of the international search

24 January 2002

Date of mailing of the international search report

04/02/2002

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Vuillamy, V

INTERNATIONAL SEARCH REPORT

Intern Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Present claims 1, 12, 13, 18, 19 relate to an extremely large number of possible combinations of polysaccharides. Support within the meaning of Article 6 PCT and/or disclosure within the meaning of Article 5 PCT is to be found, however, for only a very small proportion of these combinations. In the present case, the claims so lack support, and the application so lacks disclosure, that a meaningful search over the whole of the claimed scope is impossible. Consequently, the search has been carried out for those parts of the claims which appear to be supported and disclosed, namely those parts relating to the polysaccharides disclosed in claims 2 and 5: the first polysaccharide is selected from alginate, pectin or carrageenan, and the second polysaccharide is a galactomannan.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

INTERNATIONAL SEARCH REPORT

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Intern d Application No

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Information on patent family members

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(74) Agent: **WITTOP KONING, T. H.**; Exter Polak & Char-
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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- with amended claims and statement

Date of publication of the amended claims and statement:

25 July 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: COMPOSITION AND METHOD FOR COATING FOODSTUFFS

(57) Abstract: A composition for coating foodstuffs is described, where the composition comprises a first polysaccharide that is negatively charged in the composition and gels under the influence of cations, and at least a second polysaccharide which is neutral in the composition. A method for producing an edible coating is also described, as well as a method for coating foodstuffs. A coating formed by the first-named method and a foodstuff which contains such a coating are furthermore disclosed.

WO 02/015715 A1

AMENDED CLAIMS

[received by the International Bureau on 4 April 2002 (04.04.02);
original claims 1-19 replaced by amended claims 1-16 (2 pages)]

1. Composition for coating foodstuffs which comprises a first polysaccharide, chosen from the group consisting of alginate, pectin, carrageenan or a combination thereof and at least a second polysaccharide, the second polysaccharide comprising galactomannans, the composition having a viscosity of 80-100 Pa.s at a temperature of 20°C.
2. Composition according to claim 1, **characterized** in that the first polysaccharide comprises alginate.
3. Composition according to claim 2, **characterized** in that the composition comprises 1-7 w/w%, preferably 2-4 w/w% and most preferably 2.3-3.0 w/w% of the first polysaccharide, preferably alginate.
4. Composition according to any of the preceding claims, **characterized** in that the galactomannans are chosen from the group consisting of guar gum, carob gum or a combination thereof.
5. Composition according to any of the preceding claims, **characterized** in that the galactomannans comprise guar gum.
6. Composition according to any one of the preceding claims, **characterized** in that the composition comprises 2-10 w/w%, preferably 3-6 w/w% galactomannans, preferably guar gum.
7. Composition according to any one of the preceding claims, **characterized** in that the pH of the composition lies between 4.0 and 9.5, preferably between 4.0 and 7.5, more preferably between 4.0 and 6.0, even more preferably between 4.5 and 5.5, and is most preferably 5.
8. Composition according to any one of the preceding claims, **characterized** in that the composition comprises 0-4 w/w% protein.
9. Edible coating for foodstuffs, in particular a sausage

product, which comprises at least a first polysaccharide, chosen from alginate, pectin, carrageenan or a combination thereof, and a second polysaccharide, comprising galactomannans.

- 5 10. Method for producing an edible coating, comprising the steps of:
- a) extruding a coating composition according to any one of claims 1-8 to obtain an extruded coating composition, and
- 10 b) bringing the extruded composition into contact with a gelling agent to form a gelled coating.
11. Method according to claim 10, **characterized** in that the coating composition in step a) is co-extruded around a foodstuff to be coated.
12. Method according to one of claims 10-11, **characterized** in that the composition after step b) is brought into an acid environment, the pH of which is 3 or less.
- 15 13. Method according to claim 12, **characterized** in that the acid environment comprises liquid smoke, a component or derivative thereof, lactic acid, acetic acid or a combination of two or more thereof.
- 20 14. Method according to any one of claims 10-13, **characterized** in that the coating formed is brought into contact with a solution, the solution comprising 0.1-0.5 w/w%, preferably 0.25 w/w% acetic acid, 0.1-0.5 w/w%, preferably 0.25 w/w% lactic acid and 0.1-1.0 w/w%, preferably 0.5 w/w% liquid smoke or a derivative thereof.
- 25 15. Coating obtainable by the method according to any one of claims 10-14.
- 30 16. Foodstuff which contains a coating according to claim 9 or 15.

STATEMENT UNDER ARTICLE 19(1) PCT

This statement relates to amended claims, filed pursuant to article 19 PCT in the case PCT/NL01/00628, published as WO 02/15715.

The claims have been amended in order to bring the application more into conformity with the literature, cited in the search report.

Present claim 1 is a combination of claims 1, 2, 5 and 9 as originally filed.

Claim 9 (original claim 12) has been amended accordingly.

Original claims 2, 5 and 9 have been deleted and the remaining claims have been renumbered accordingly.